

# NASA SBIR/STTR Technologies

## T3.01-9994 - MEMS Based Solutions for an Integrated and Miniaturized Multi-Spectrum Energy Harvesting and Conservation System

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### Identification and Significance of Innovation

The objective of this proposal is to develop three unique energy harvesting technologies utilizing our existing research strengths that will be of interest and utility to NASA applications and environmental conditions. By developing multiple technologies, NASA will be able to harvest energy from multiple waste energy sources, namely environmental vibrations, thermal energy, and solar flux. These devices will initially be developed separately, but all the while with an eye on the final integration into a single package at the end of Phase II. Since the research on these technologies has been ongoing, it is reasonable to develop an initial prototype of these technologies at the end of Phase I, with integration occurring in Phase II. The proposed integrated energy harvesting concept device is shown in Figure 1.

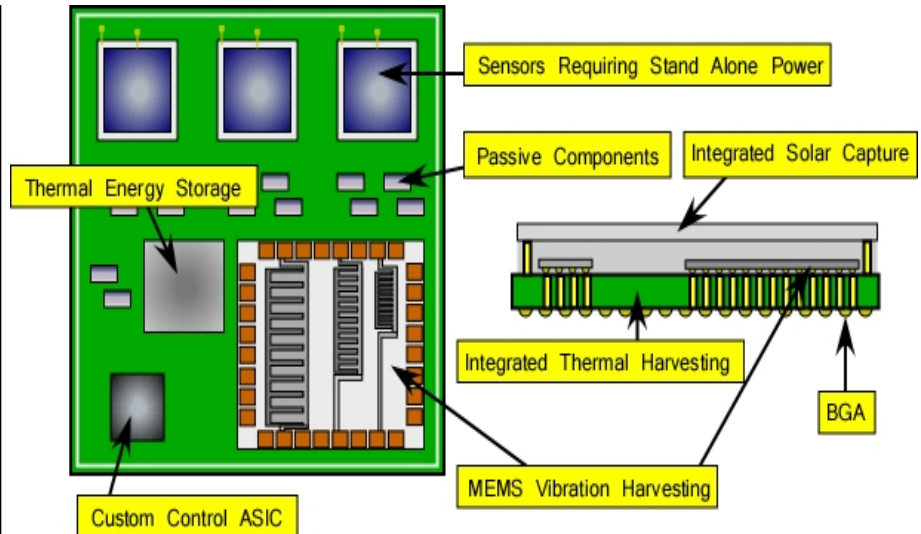
Estimated TRL at beginning and end of contract: ( Begin: 2 End: 4 )

### Technical Objectives and Work Plan

The primary goal of Phase I activities will be to fabricate the transducers that will harvest energy from environmental vibrations of machines and aircraft, thermal energy retained in launch structures and the ambient environment, as well as solar energy collection enhanced by surface plasmons. The major requirements and specifications of the effort are listed below:

- 1) Modeling and simulation of the transducers' behavior and performance.
- 2) Fabrication of the transducer devices.
- 3) Testing and characterization of the devices.
- 4) Development of a path forward for a fully functioning integrated prototype for Phase II.

The work in this project will be divided between Radiance Technologies and Louisiana Tech. Tech will be responsible for studying and creating the transducers portion of the project including modeling and simulation and fabrication. Radiance will design and fabricate the electronics interfacing with the transducers, assist with transducer fabrication when necessary, and manage the overall progress of the project.



### NASA Applications

This program has significant application to the current NASA mission. This proposal targets many of the technical challenges outlined in the NASA Space Power and Energy Storage roadmap. All of the technologies which support the Outer Planetary and Inner Planetary missions as well as the Space Operations Mission directorate require new methods of power and energy storage where these technologies would apply.

### Non-NASA Applications

This program has commercial applications in addition to those which benefit the current NASA mission. Energy and power are at the forefront of every discussion related to advancing microelectronics and systems. Additionally monitoring the health of electronic and mechanical systems has proven to be an emerging need across many military and commercial systems alike.

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**NON-PROPRIETARY DATA**